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EXAMINER

LOEWE, ROBERT S

ART UNIT

PAPER NUMBER

1796

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

**Application No.**

10/540,833

**Applicant(s)**

SATO ET AL.

**Examiner**

ROBERT LOEWE

**Art Unit**

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 February 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 5, 7, 10-13, 17 and 18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 5, 7, 10-13, 17 and 18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB-06)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

Applicants arguments/remarks, filed on 2/19/10, have been fully considered. Applicants argue that, contrary to the Examiners calculations, Miyahara et al. does not teach the number of moles of alkali metal hydroxide to charged sulfur source as required by the instant claims (specifically a ratio of 1.015 to 1.050). The Examiner has read and understood Applicants recalculations of the teachings of Miyahara et al. to show that such ratios are not inherent by Miyahara et al., as previously stated by the Examiner. In light of these new calculations, Miyahara et al. can no longer be relied upon as an anticipatory reference. However, Miyahara et al. still qualifies as a suitable obviousness type reference for all claims as described in the rejection below.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 5, 7, 10-13, 17 and 18 are rejected under 35 U.S.C. 103(a) as being anticipated by Miyahara et al. (US Pat. 5,840,830).

Claims 5 and 18: Miyahara et al. teaches a process for producing a poly(arylene sulfide) by polymerizing a sulfur source and a dihalo-aromatic compound in an organic amide solvent. Miyahara et al. first teaches a dehydration step whereby sodium sulfide and N-methyl-2-pyrrolidone (NMP, an organic amide solvent) are subjected to distillation, removing a part of the distillate containing water (10:55-67). The hydrogen sulfide gas which forms during this step is taught to be removed from the system. This removal of hydrogen sulfide is directly linked with a weight loss of sulfur in the reaction vessel. While Miyahara et al. teaches that the volatilized hydrogen sulfide may be recycled back into the system, this is not a teaching away from the limitation that hydrogen sulfide is discharged as a gas to the exterior of the system as required by the claims. Further, while Miyahara et al. teaches recycling of the volatilized hydrogen sulfide, said recycled hydrogen sulfide does not necessarily mean that such hydrogen sulfide is recycled back into the same system from which it was volatilized. Indeed, Miyahara et al. teaches that the recovered hydrogen sulfide may be used for other embodiments, some of which do not include re-addition to the reaction vessel from which the hydrogen sulfide was volatilized (8:19-34).

While Miyahara et al. employs sodium sulfide pentahydrate as the starting material in the working examples, Miyahara et al. does explicitly teach that the sodium sulfide can be produced in situ by reaction of sodium hydrosulfide and sodium hydroxide (4:61-64) "in an almost equimolar amount" (6:49-53). The teaching "in an almost equimolar amount" would certainly

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suggest to a person having ordinary skill in the art to be within the claimed mol ratio of 0.95 to 1.02 of step (1) of instant claim 5. The reaction between sodium hydrosulfide and sodium hydroxide inherently produces water, therefore, the alkali metal hydrosulfide is present as an aqueous mixture with water as required by instant claim 5. Further, Miyahara et al. teaches that the alkali metal sulfide is generally used in the form of a hydrate or aqueous mixture. Since water is inherent to the dehydration step as taught by Miyahara et al., the limitation that the alkali metal sulfide is present as an aqueous mixture with water is inherently taught by Miyahara et al. Miyahara et al. therefore effectively anticipates the process limitations corresponding to dehydration step (1) of instant claim 5.

Miyahara et al. further teaches a charging step of adding sodium hydroxide and water to the mixture remaining after the dehydration step such that the mole ratio of water to charged sulfur source is from 0.3 to 5.0 (6:61-65) and that the total number of moles of NaOH to charged sulfur source may be at or very close to Applicants upper limit of the claimed ratio of 1.015 to 1.050. Using Applicants calculations for example 3a of Miyahara et al., the total number of moles of NaOH to charged sulfur source is 1.054, which is very close to Applicants upper limit of 1.050 (only a 0.004 difference in the ratio). "A prima facie case of obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected [the claimed product and a product disclosed in the prior art] to have the same properties." *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). While Applicants instant specification does exemplify several working examples having various NaOH to charged sulfur source ratios, the different NaOH to charged sulfur source ratios are much greater in the various working examples. Specifically, Applicants

working examples show similar properties of the final polymers prepared when employing a NaOH/sulfur source ratio of 1.020 and 1.050, the difference between these two ratios being 0.030, which is over seven times greater than the 0.004 difference as calculated according to example 3a of Miyahara et al.

Miyahara et al. further teaches a first-stage polymerization step of adding a dihalo-aromatic compound to the mixture followed by polymerization at 180 °C to 235 °C to form a prepolymer at a conversion rate of 50-98 mol% (9:23-34). Miyahara et al. therefore effectively anticipates the process limitations corresponding to a first-stage polymerization step (3) of instant claim 5.

Miyahara et al. further teaches a second-stage polymerization step of controlling the amount of water such that there is from 2.0 up to 10 mol of water per mole of charged sulfur source with heating at 245 °C to 290 °C to continue polymerization (9:23-34). Miyahara et al. therefore effectively anticipates the process limitations corresponding to a second-stage polymerization step (4) of instant claim 5. In summary, Miyahara et al. anticipates all of the claimed process steps of instant claim 5.

The melt viscosity of the poly(arylene sulfides) taught by Miyahara et al. all fall within the claimed range of instant claim 5. While Miyahara et al. does not explicitly teach the other physical property limitations of instant claims 5 and 18, Miyahara et al. does explicitly teach all of the claimed process steps. Since the poly(arylene sulfide) as taught by Miyahara et al. and Applicant's disclosure are both produced in the same manner, any physical properties achieved by the compositions of Miyahara and the instant application would inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the

identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established." See MPEP 2112.01.

Claim 7: Miyahara et al. further teaches during the dehydration step, that the reaction mixture is heated to a temperature of 60 to 280 °C (7:11-24).

Claim 10: Miyahara et al. does not explicitly teach that the prepolymer according to instant claim 5 has a melt viscosity during the first-stage polymerization step of 0.5 to 30 Pa.s. However, the poly(arylene sulfide) as taught by Miyahara et al. and Applicant's disclosure are both produced in the same manner, therefore any physical properties achieved by the compositions of Miyahara and the instant application would be inherently be the same. A chemical composition and its properties are inseparable. Therefore, if the prior art teaches the identical chemical structure, the properties applicant discloses and/or claims are necessarily present. *In re Spada*, 911 F.2d 705,709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). See also *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "Where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established." See MPEP 2112.01

Claim 11 : Miyahara et al. further teaches after the second-stage polymerization step, (5) a separation step of separating the polymer from the reaction mixture containing the polymer, and (6) a washing step of washing the polymer thus separated with an organic solvent (9:49-64).

Claim 12: Miyahara et al. further teaches that the separation is achieved by sieving/filtering (9:49-64).

Claim 13: Miyahara et al. further teaches that the organic solvent used in the washing step is acetone (11:21-26).

Claim 17: Miyahara et al. teaches the process of instant claim 5, as described above. While Miyahara et al. does not exemplify a poly(arylene)sulfide having a melt viscosity which satisfies instant claim 7, it is believed that Miyahara et al. renders obvious this melt viscosity range. Specifically, Miyahara exemplifies polymerization at 220 °C for 4.5 hours, or polymerization at 220-260 degrees C for 1.5 hours (Table 1). However, Miyahara et al. teaches that both the polymerization times and temperatures may be longer than what is exemplified. Specifically, Miyahara et al. teaches a polymerization temperature of up to 350 °C, preferably up to 330 °C (8:65-66) and a polymerization time of up to 72 hours, preferably up to 48 hours. Increasing either the temperature of polymerization or polymerization time would be expected to increase the final melt viscosity of the poly(arylene)sulfide produced. It is submitted by the Examiner that either an increase in the polymerization temperature or an increase in the polymerization time would generate poly(arylene)sulfides of higher molecular weight, which would inherently display a higher melt viscosity. Therefore, it is believed that Miyahara et al. renders obvious the limitations of instant claim 17. It is well within the level of a person having



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ordinary skill in the art to carry out the polymerization reactions at various temperature and times as taught by Miyahara et al.

### *Correspondence*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT LOEWE whose telephone number is (571)270-3298. The examiner can normally be reached on Monday through Friday from 5:30 AM to 3:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (571) 272-13021302. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Robert Loewe/  
Patent Examiner, Art Unit 1796  
22-Feb-10